

2D Barcode Technology



Missouri Department of Revenue



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2D Barcode — General Information

Printers

(from Symbol Technologies) Any printer capable of printing graphics can print PDF417 Barcodes. This includes laser, ink jet, bubble jet, and dot matrix printers. You don't need a very high resolution printer either. Many label printers are only 200 dpi and they print very high quality PDF417 barcodes. Back in the spring, Symbol Technologies gave a short conference at Indiana on PDF417 and the tax software. There was a computer lab, and we installed PDF417 software. The printers were very cheap inkjets. Each one was able to print PDF417 Barcodes, and the Barcodes were scanned successfully.

Barcode Size

Using the DLL created by Symbol Technologies, the Barcode width is 3.45". The maximum height depends on the number of lines passed. One vendor had a problem with the variable height Barcode. After some testing, 5/8" was defined as the "best" height if a variable length Barcode was not utilized.

File Specifications

We have maximum field lengths based upon our mainframe file specifications (all fields have maximum lengths). The fields need not be padded to reach the maximum lengths. If a field exceeds the maximum field length the return won't be able to be scanned and moved into our file format correctly and will kick out with an error. All returns that error will be keyed manually. For example, a taxpayer's name is 40 characters in length. The maximum our mainframe system allows for the last name and first name is 29 characters, including a comma which separates the names. If we receive a name over 29 characters, the return will be manually keyed after it kicks out with an error during our scanning process. Another example, Federal Adjusted Gross Income is a maximum of 9 numbers. If more than 9 numbers are keyed, the return will be manually keyed after it kicks out with an error during our scanning process. We feel this is the most secure method of verifying data coming into our system is correct. All data received should use the maximum lengths defined in our file specifications.

Processing of Returns

The Barcoded tax returns are processed through normal return process. There were several reasons, if the 2D Barcoded Returns are processed in the same manner as normal returns, one system with the same fields, could be developed to handle both entry methods. One system could be used to verify returns, create batches, cashier money, and FTP the batches to the mainframe. If there are Barcode creation or conversion problems, the errors will be found during the review of the returns in the normal process.

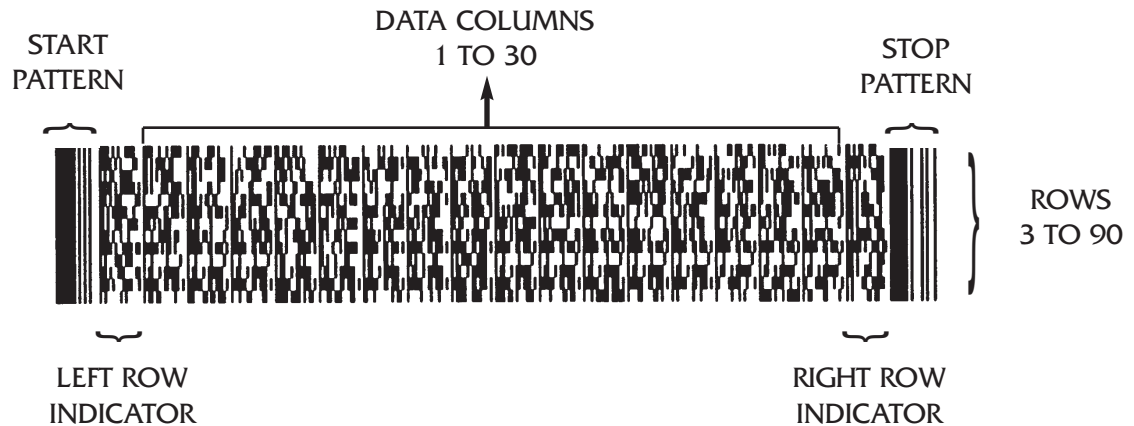
Programming Notes

The scanner is turned on and off through programming code. The F9 key is used to turn the scanner on and a "notice" box is displayed with a message stating "Waiting to Scan". During a scan, a message "Scanning" appears in the "notice" box. The populated data entry form is displayed and the scanner is turned off. When a document was saved or cancelled, the scanner was turned on and the "Waiting to Scan" message displayed on the screen. The DLL from Symbol Technologies was used to both read and write 2D Barcodes. The programming was completed in Visual Basic 5.0. One small system was developed to verify information from vendors. This system included a screen of text boxes for each field in the file layout. The small system was required, due to the length of time to create the production system and the need to approve 2D software in a short period of time.

What is a PDF417?

A two-dimensional stacked barcode symbology providing sufficient information density and capacity for both Portable Data File and small item marking applications.

PDF417 Anatomy



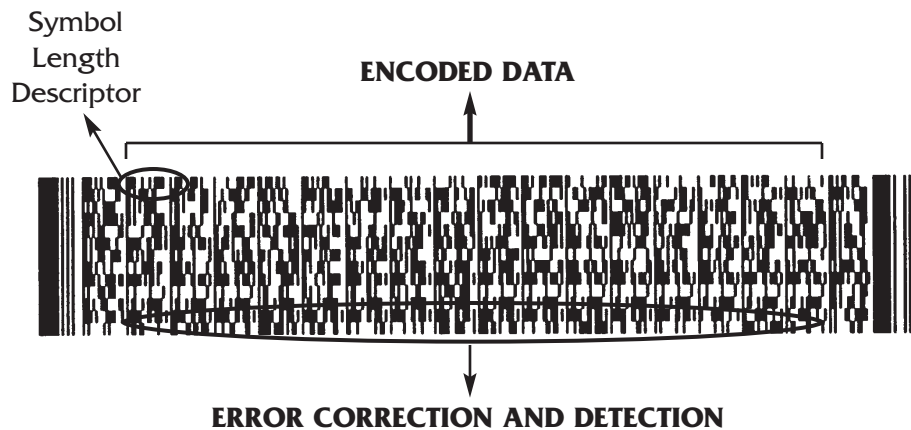
Start and stop patterns are used to delineate where a PDF417 begins and ends and makes reading symbol bi-directional.

Row indicators are located on the left and right side. The row indicators contain information on number of rows, number of columns and the error correction level.

Data Columns are where data and error correction information are located. Data columns are flexible and can be between 1 and 30.

Rows are variable; can be between 3 and 90. Row height, or Y dimension, is user selectable. Recommended Y dimension is 3X.

PDF417 Anatomy



Codewords are the basic unit of storage in a PDF417 barcode. It contains data, or error correction information. Also, used for row indicator information.

Encoded Data is located in the upper part of data codeword section. It includes “Symbol Length Descriptor” or SLD. First codeword in Symbol. Total number of data codewords including itself.

Error Correction Codewords — There are 9 levels of error correction from 0 to 8. Level 0 allows only error detection. Level 1 through 8 allows for correction and detection. Located in the lower part of the data codeword section. Error detection and correction is one of the most important features of the PDF417. It is a means of compensating for label defects and misdecodes. Data errors are detected and data integrity is maintained. In the event the symbol is damaged, the data originally encoded must be recoverable.

Printer Requirements

In order to print barcodes, a printer must have graphics capability or embedded barcode capability. There needs to be sufficient resolution for intended application.

X Dimension — Barcode size are specified by its X dimension. The X dimension is defined as the width of the narrowest bar. Each bar and space is an exact multiple of the X dimension. The single X dimension is also referred to as a module.

Resolution — X dimension is determined by printers DPI and the number of Pixels Per Module (PPM)
 $X = \text{PPM} / \text{DPI}$

Example of 3 PPM PDF417 Start Pattern: On a 300 DPI laser $X = 3 / 300 = .01 = 10 \text{ mil}$.

Ink Spread — Like other barcodes, PDF417 is capable of withstanding uniform ink spread. A software technique called Pixel shaving (or bar width reduction), takes advantage of T sequences. Bar width reduction uniformly reduces ink spread.

Scaling Errors — Scaling errors are introduced when barcode images are stretched or shrunk. A 100 module barcode must be printed in multiple of 100 pixels.

Sample 2001 2-D Barcode Form MO-1040 for Software Vendors to Reproduce



MISSOURI DEPARTMENT OF REVENUE 2001 FORM MO-1040 INDIVIDUAL INCOME TAX RETURN—LONG FORM

FOR CALENDAR YEAR JAN. 1-DEC. 31, 2001, OR FISCAL YEAR BEGINNING
2001, ENDING 20

AMENDED RETURN —CHECK HERE ☐ SOFTWARE
STEP 1 — NAME AND ADDRESS VENDOR CODE
(Assigned by DOR)

SOCIAL SECURITY NUMBER SPOUSE'S SOCIAL SECURITY NUMBER

NAME (LAST, FIRST) M.I. JR, SR ☐ DECEASED
IN 2001

SPOUSE'S (LAST, FIRST) M.I. JR, SR ☐ DECEASED
IN 2001

IN CARE OF NAME (ATTORNEY, EXECUTOR, PERSONAL REPRESENTATIVE, ETC.) COUNTY OF RESIDENCE SCHOOL DISTRICT NO.

PRESENT ADDRESS (INCLUDE APARTMENT NUMBER OR RURAL ROUTE) CITY, TOWN, OR POST OFFICE, STATE, AND ZIP CODE

You may contribute to any one or all of the trust funds. Place the total amount contributed on
Lines 46a, 46b, 46c, and 46d. See instructions for a complete description of each trust fund.



Children's
Trust
Fund



Veterans
Trust
Fund



Elderly Home
Delivered Meals
Trust Fund



Missouri
National Guard
Trust Fund

PLEASE CHECK THE APPROPRIATE AGE 65 OR OLDER BLIND 100% DISABLED NON-OBLIGATED SPOUSE
BOXES THAT APPLY TO YOU/YOUR SPOUSE. ☐ YOURSELF ☐ SPOUSE ☐ YOURSELF ☐ SPOUSE ☐ YOURSELF ☐ SPOUSE ☐ YOURSELF ☐ SPOUSE

| STEP 2 — FIGURE YOUR MISSOURI ADJUSTED GROSS INCOME | | Yourself | | Spouse | |
|---|----|----------|----|--------|----|
| 1. Federal adjusted gross income (See worksheet.) | 1Y | | 00 | 1S | 00 |
| 2. Total additions (from Form MO-A, Part 2, Line 4) | 2Y | | 00 | 2S | 00 |
| 3. Total income. Add Lines 1 and 2. | 3Y | | 00 | 3S | 00 |
| 4. Total subtractions (from Form MO-A, Part 2, Line 9) | 4Y | | 00 | 4S | 00 |
| 5. Missouri adjusted gross income. Subtract Line 4 from Line 3. | 5Y | | 00 | 5S | 00 |
| 6. Total Missouri adjusted gross income. Add columns 5Y and 5S. | 6 | | 00 | | |
| 7. Income percentages — Divide columns 5Y and 5S by total on Line 6. (Total of columns 7Y and 7S must equal 100%.) | 7Y | | % | 7S | % |

| STEP 3 — FIGURE YOUR TAXABLE INCOME | | Yourself | | Spouse | |
|--|-----|---|----|--------|----|
| 8. Pension exemption (from Form MO-A, Part 3, Line 11) | 8 | | 00 | | |
| 9. Mark your filing status box and enter appropriate exemption amount here. | 9 | | 00 | | |
| <input type="checkbox"/> A. Single — \$2,100 (See Box B before checking.) <input type="checkbox"/> B. Claimed as a dependent on another person's federal tax return — \$0.00 <input type="checkbox"/> C. Married filing joint federal & combined Missouri — \$4,200 <input type="checkbox"/> D. Married filing separate — \$2,100 | | <input type="checkbox"/> E. Married filing separate (spouse NOT filing) — \$4,200 <input type="checkbox"/> F. Head of household — \$3,500 <input type="checkbox"/> G. Qualifying widow(er) with dependent child — \$3,500 | | | |
| 10. Missouri STANDARD DEDUCTION OR ITEMIZED DEDUCTIONS (See Line 10 instructions.) | 10 | | 00 | | |
| 11. Federal income tax liability from: • Federal Form 1040, Line 52 plus Line 47 minus Lines 41 and 61a; or • Federal Form 1040A, Line 34 plus Line 30 minus Line 39a; or • Federal Form 1040EZ, Line 11 minus Line 9a; or • Federal Telefile Tax Record, Line K(2) (second box) minus Line L(2) (second box) (Do not enter amount from your Form W-2(s)—Not Federal Tax Withheld.) | 11 | | 00 | | |
| 12. Other federal tax. Attach copy of your federal return (pages 1 and 2). | 12 | | 00 | | |
| 13. Total federal tax. Add Lines 11 and 12. | 13 | | 00 | | |
| 14. Federal tax deduction. Enter amount from Line 13 not to exceed \$5,000 for individual filer (\$10,000 for combined). | 14 | | 00 | | |
| 15. Number of dependents from Federal Form 1040 OR 1040A, Line 6c (DO NOT INCLUDE YOURSELF OR SPOUSE.) | 15 | | 00 | | |
| 16. Number of dependents on Line 15 who are 65 years of age or older and do not receive Medicaid or state funding (DO NOT INCLUDE YOURSELF OR SPOUSE.) | 16 | | 00 | | |
| 17. Self-employed health insurance deduction | 17 | | 00 | | |
| 18. Long-term care insurance deduction | 18 | | 00 | | |
| 19. Total deductions. Add Lines 8, 9, 10, 14, 15, 16, 17, and 18. | 19 | | 00 | | |
| 20. Subtotal. Subtract Line 19 from Line 6. | 20 | | 00 | | |
| 21. Multiply Line 20 by appropriate percentages (%) on Line 7. | 21Y | | 00 | 21S | 00 |
| 22. Enterprise zone income modification | 22Y | | 00 | 22S | 00 |
| 23. Subtract Line 22 from Line 21. Enter here and on Line 24. | 23Y | | 00 | 23S | 00 |



See the
instructions.

Do not
include
yourself
or
spouse.

Approved 2D Barcode Software Vendors for Tax Year 1999

Creative Solutions
H & R Block

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Creative Solutions
Drake Software
Dunphy Systems
H & R Block
Research Institute of America (RIA)
STF Services
Tax Works

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CCH
Creative Solutions
Drake Software
Dunphy Systems
H & R Block
Research Institute of America (RIA)
STF Services
Tax Works